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I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears an amendment, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

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Dated 1 October 2003



THE PATENT OFFICE



16 APR 2002

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1  
16 APR 2002 E711239-1 084268  
PA17770000.00-0208639.5

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP10 8QQ

1. Your reference

2. Patent application number

(The Patent Office will fill in this part)

0208639.5

16 APR 2002

3. Full name, address and postcode of the or of each applicant (underline all surnames)

① Michael Charles Richard Bartlett of Old Castle Farm,  
Fairyland Road, Tomma, Neath, West Glamorgan and ② Steven Phillip Corcoran of  
22 Great Close, Cawood, North Yorkshire, YO8 3UG

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

① 8764135001  
② 8364150001

R-

SPC

TEN

4. Title of the invention

Coupling

5. Name of your agent (if you have one)

SPC

"Address for service" in the United Kingdom to which all correspondence should be sent

(including the postcode) Urquart-Parker + Lord  
2nd add (apart from 1st)  
for M. C. R. Bartlett, At Alexandra House  
Mr M.C.R. Bartlett - as above

F5177 13/1/03 | Alexandra Rd.  
SWANSEA

Patents ADP number (if you know it) SA150

STEVEN PHILLIP CORCORAN  
22 GREAT CLOSE  
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6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

No

- a) any applicant named in part 3 is not an inventor, or
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Continuation sheets of this form

Description

Claim(s)

Abstract

Drawing(s)

3 only

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Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents  
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date

11<sup>th</sup> Oct '01

0757 268 257

12. Name and daytime telephone number of person to contact in the United Kingdom

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Title: Coupling

The present invention relates to a coupling, particularly to a rotational union coupling.

In the production of steel sheet and the like, blocks of steel are rolled over continuous casting rollers. Such continuous casting rollers need to be cooled continuously, and it is usual to pass water through the continuous casting rollers as a cooling medium. A water supply is connected to the end of each continuous casting roller by a rotational union coupling. The coupling consists of a water inlet and outlet housing mounted on a rotor shaft. The rotor shaft remains static and rotates relative to and inside a flange body which engages and rotates with the end of the continuous casting roller.

In some single water flow systems, water passes into one end of a continuous casting roller and out through the other. In other instances a dual flow system is utilised where a water tube extends from the coupling in axial alignment with and inside the continuous casting roller. Water flows from the coupling down the water tube and back to the coupling between the tube and the continuous casting roller.

A number of problems exist with the use of known rotational union couplings.

A first problem is that there are generally two different sizes of continuous casting rollers each using single and dual flow water cooling systems. This means that four different sizes and designs of couplings are required.

A second problem is that occasionally known coupling housings can blow off the rotor shaft if the pressure in the water system becomes excessive, e.g. due to steam pressure build up if the water supply is accidentally turned off. When the water supply is turned back on the coupling will leak causing spillage of water preventing flow of water through the system, and this creates a breakdown in the cooling system.

A third problem is that wear occurs between the coupling housing and the rotor shaft reducing the life of the rotational union coupling.

A fourth problem is that the water flow path in known couplings tends to be complicated leading to inefficient flow patterns.

The invention seeks to provide a novel rotational union coupling which avoids the above difficulties.

According to the present invention there is provided a rotational union coupling comprising:

- a) a cylindrical flange housing having a flange at one end and an internal cylindrical aperture along its axis of rotation, said flange housing being adapted to be secured to the end of a continuous casting roller,
- b) a rotor shaft having a first cylindrical part to rotate inside the cylindrical aperture and a second part connected to the first part which projects out of the housing from said flange,
- c) a first water aperture connected to the wall of the second part, and

d) a sealable aperture adapted to receive a bend radius connectable to the wall of the second part to provide a second water aperture.

Preferably the first and second part of the rotor shaft are integrally formed. Preferably the first and second part of the shaft are cylindrical.

Preferably the first water aperture projects from the second part of the rotor shaft substantially at 90 degrees to the sealable aperture.

Preferably the bend radius has an internal aperture with an annular wall axially co-aligned with the rotor shaft. Preferably the internal aperture is adapted to receive an extension tube axially aligned with the rotor shaft and a continuous casting roller. Preferably the bend radius can receive two sizes of extension tube, one in which the diameter of the tube fits into the internal diameter of the aperture and one in which the external diameter of the annular wall fits inside the tube.

Preferably the bend radius has an external aperture with an annular wall adapted to be connected to two different sizes of connectors. The annular wall may be internally and externally threaded.

The sealable aperture may include a removable plug which can be removed upon use of the bend radius.

Preferably the first water aperture has an external aperture with an annular wall adapted to be connected to two different sizes of connectors. The annular wall may be internally and externally threaded.

Preferably the rotor shaft has an annular flange at an end remote from said second part which seats in an annular recess in the end of the flange housing remote from the flange. Preferably the position of the flange in the recess can be adjusted to adjust the position of the first part of the shaft relative to the flange housing, whereby to reduce wear of the first part of the shaft at any given point thereon. The position may be adjusted by a removable spacer in the flange housing annular recess.

Preferably the second part of the rotor shaft includes a weakened wall portion which ruptures when pressure in the shaft rises above a predetermined level.

An embodiment of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows a cross section view of a coupling adapted for a single flow water cooling system,  
Figure 2 shows a cross section view of a coupling adapted for a dual flow water cooling system,  
and

Figure 3 shows a side end perspective view of the coupling of Figure 2.

Referring to the drawing there is provided a rotational union coupling 1. Coupling 1 has a cylindrical flange housing 2 having a flange 3 at one end and an internal cylindrical aperture 4 along its axis of rotation. A continuous casting roller 5 is supported for rotation by a bearing plate 6 (continuous casting roller 5 and bearing plate 6 are well known in the art and are not described fully herein). Flange 3 is designed to be secured to the bearing plate 6 (and hence continuous casting roller 5) by bolts passing through flange apertures 3A, whereby flange housing 2 rotates with the continuous casting roller 5. Flange housing 2 fits inside the continuous casting roller 5 and is sealed therein by seal ring 7.

A cylindrical rotor shaft 8 has a first cylindrical part 8A to rotate inside the cylindrical aperture and a second part 8B (integral with first part 8A) which projects out of the housing away from flange 3. An integral annular flange 8C is provided at the end of shaft 8 remote from second part 8B which rests in a recess 9 in flange housing 2. Quad seals 10A,10B seal the shaft 8 to housing 2. A bearing 11 supports the shaft 8 for rotation in housing 2. A spring washer 12A, circlip thrust 12B, and circlip 12C prevent lateral movement of shaft 8 relative to housing 2. A spacer 13 spaces flange 8C from the bottom of recess 9.

A first water aperture in the form of a cylindrical projection 14 with an annular wall (see Figure 3) is connected to the wall of the second part. Projection 14 may externally and internally threaded to receive two different sizes of pipe connectors.

An aperture 15 is sealed by a removable plug 16. Also a burst pressure plug is provided by a rupturable thin walled portion 17 in tube 8B. The weakened wall portion ruptures when pressure in the shaft rises above a predetermined level.

In use of the coupling in Figure 1, two such couplings can be mounted at either end of a continuous casting roller for a single flow system. Each first water aperture projection 14 serve as a water inlet and outlet respectively through which water can be passed to cool a continuous casting roller. If water pressure should build up above a predetermined level, the thin walled portion 16 will rupture to disperse excess pressure. Whilst this will leak when water is passing through the continuous casting roller, it will not prevent circulation of water through the cooling system.

Referring now to Figure 2, the coupling is identical to that of Figure 1 except that plug 16 has been removed and a second water aperture is provided in the form of a bend radius 20. Bend radius 20 has an external aperture defined by external annular wall 21 with a wall flange 22 which can be fixed, e.g. by welding, to the shaft 8 to seal aperture 15. External annular wall 21 may be threaded externally and internally and is adapted to receive two sizes of pipe connectors.

Bend radius 20 also has an internal aperture defined by an internal annular wall 23 axially co-aligned with the rotor shaft 8. The internal annular wall 23 is adapted to receive an extension tube 24 axially aligned with the rotor shaft and a continuous casting roller. Annular wall 23 can receive two sizes of extension tube, one in which the diameter of the tube fits into the internal

diameter of the aperture (not shown) and one in which the external diameter of the annular wall fits inside the tube (as shown in Figure 2). Lugs (not shown) may be provided which project externally and/or internally from annular wall 23 to engage with slots at the end of an extension tube to prevent the extension tube rotating relative to the bend radius. These lugs allow secure fitment of the extension tube to the bend radius whilst also allowing a clear flow path for water flowing through the bend radius.

As shown in Figure 3, the first water aperture projection 14 projects from the second part of the rotor shaft substantially at 90 degrees to the sealable aperture 15.

In use of the coupling of Figure 2, one coupling is provided at the end of a continuous casting roller to provide a dual flow system. As shown by the arrows, water can flow in through bend radius 20, through the inside of tube 24, back between the tube 24 and the continuous casting roller, and out through projection 14. It will be appreciated that the flow path only passes through two right angles turns (one turn through bend radius 20 and one turn out through projection 14). This leads to an efficient flow pattern.

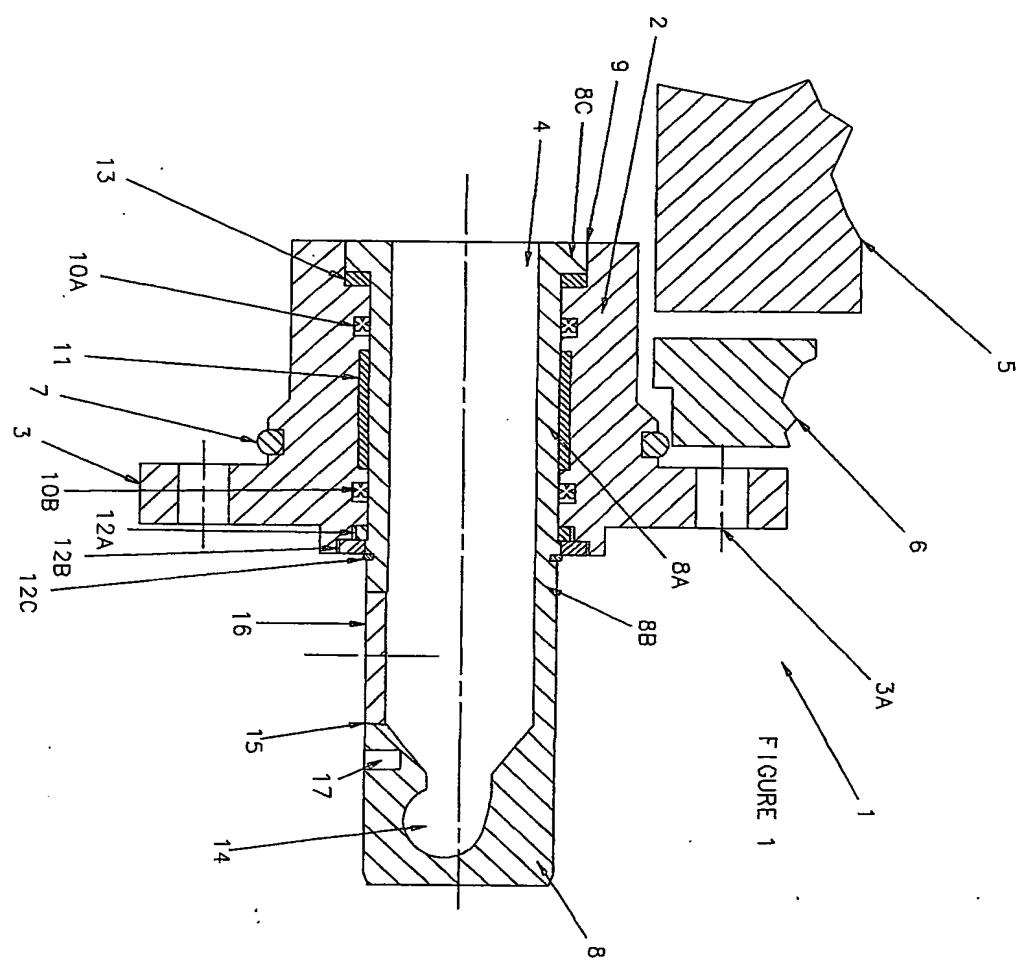
The position of the flange 8C in the recess 9 can be adjusted to adjust the position of the first part of the shaft 8A relative to the flange housing 2, whereby to reduce wear of the first part of the shaft at any given point thereon. The position may be adjusted by removing spacer 13 in the flange housing annular recess.

It will be appreciated that because the annular wall projection 14 and external annular wall 21 can receive two different sizes of pipe connectors and the internal annular wall 23 can receive two different sizes of tubes 24, one coupling can fit the different sizes of pipes and couplings used in the industry. Also with the optional use of the bend radius 20, so one coupling can be used for single or dual flow systems.

The coupling of the invention may take a form different to that specifically described above and may be made of any suitable material.

The coupling of the invention may be used with driven and non-driven rollers. The diameter and or length of a continuous casting roller will not effect the performance of the coupling.

Further modifications will be apparent to those skilled in the art without departing from the scope of the present invention.



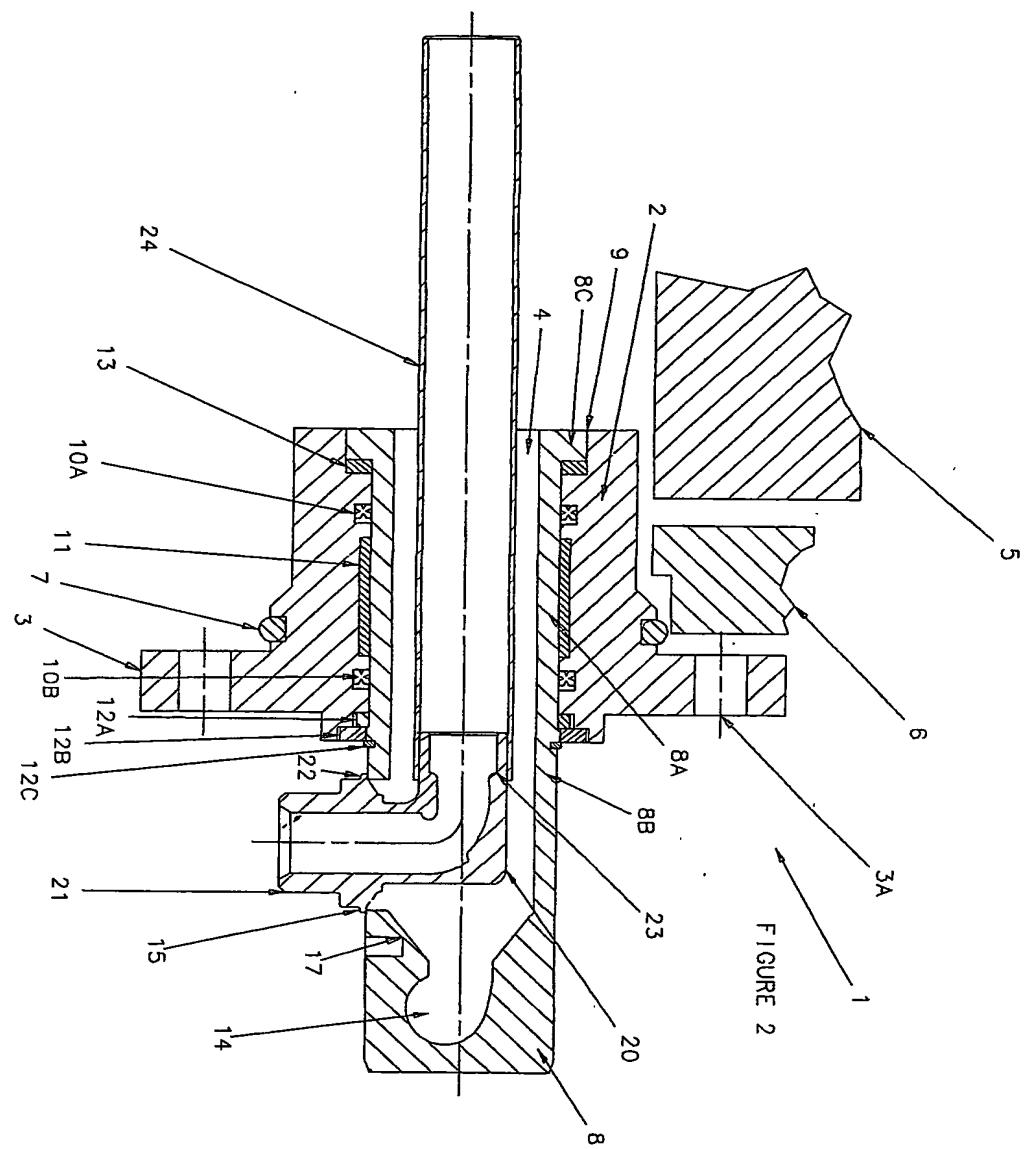
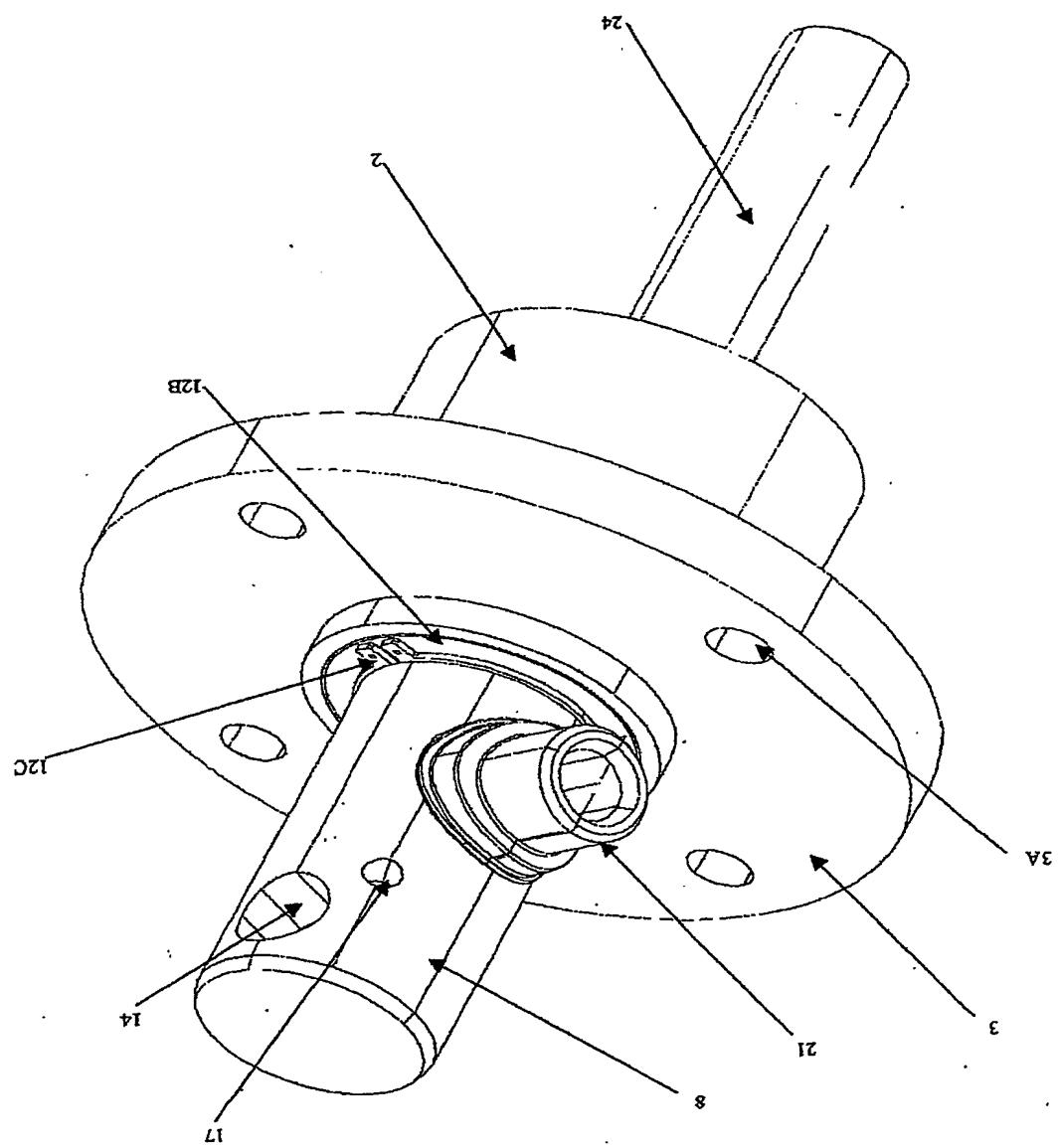


Figure 3



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